IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:	Confirmation No.: 1979
BAKER *et al.*	Art Unit: 1634
Appl. No. 09/980,884	Examiner: H Sisson, B.
Filing date: March 25, 2002	Atty. Docket: INV850/4-030US
For: **Sample Processing Device**	

Brief on Appeal Under 37 C.F.R. § 41.37

Mail Stop Appeal Brief - Patents

Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

Sir:

A Notice of Appeal from the final rejection of claims 1-22, 24, 26-30, and 32-39 was filed on November 7, 2006. Appellants hereby file this Appeal Brief, together with the required brief filing fee under § 41.20(b)(2) of $500.00.

Applicants believe that no additional fees are required in connection with this filing. However, if additional fees are due for additional extensions of time and are necessary to prevent abandonment of this application, then such extensions of time are hereby petitioned under 37 C.F.R. § 1.136(a), and any fees required are hereby authorized to be charged to our Deposit Account No. 50-3994.

Table of Contents

Table of Contents i

I. Real Party In Interest 1

II. Related Appeals and Interferences 1

III. Status of Claims 1

IV. Status of Amendments 1

V. Summary of Claimed Subject Matter 2

VI. Grounds of Rejection to be Reviewed on Appeal 6

VII. Argument 7

A. Legal Standard for Obviousness 7

B. The Cited References 7

1. The Blevins Reference 10

2. The Novotny Reference 10

3. The Stratagene Advertisement 10

4. The GIBCO Advertisement 10

C. The Examiners' Position 11

D. The Appellants' Position 12

E. Conclusion 16

VIII. Claims Appendix 18

IX. Evidence Appendix 25

X. Related Proceedings Appendix 26

I. Real Party In Interest

The real party in interest in this appeal is Invitrogen Corporation.

II. Related Appeals and Interferences

No other prior or pending appeals, interferences or judicial proceedings are known to the Appellants, the Appellants' legal representative, or assignee which may be related to, or directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

III. Status of Claims

Claims 1-24, 26-30 and 32-39 are pending in the application.

Claims 25 and 31 have been canceled.

Claims 1-22, 24, 26-30, and 32-39 are rejected.

Claim 23 is objected to.

IV. Status of Amendments

No amendments were filed subsequent to the final rejection.

V. Summary of Claimed Subject Matter

Claims 1, 26, and 33-39 are the independent claims involved in this Appeal. The invention defined by claim 1 relates generally to a method for extracting nucleic acid from a liquid mixture (e.g., a biological or a biochemical sample). The method of claim 1 involves a container that has (a) two ends; (b) a solid phase capable of binding nucleic acid and (c) a reversible suction means connected to one end of the container. The reversible suction means is used to draw the liquid mixture through the solid phase in one direction and then to force the liquid mixture over the solid phase in the reverse direction, so that nucleic acid in the sample binds to the solid phase. Support for claim 1 can be found throughout the Specification (See WO 00/75623), for example, at page 1, lines 24-29; page 3, lines 4-5;

Claim 26 relates generally to extraction device for extracting nucleic acid from a liquid mixture (e.g., a biological or a biochemical sample). The device of claim 26 includes a container that has (a) two ends; (b) a solid phase capable of binding nucleic acid and (c) a reversible suction means connected to one end of the container. The reversible suction means is used to draw the liquid mixture through the solid phase in one direction and then to force the liquid mixture over the solid phase in the reverse direction, so that nucleic acid in the sample binds to the solid phase. Support for claim 26 can be found throughout the Specification, for example, at page 1, lines 24-29; page 3, lines 4-5; page 6, line 29 to page 7, line 28.

Claim 33 relates generally to method for extracting nucleic acid from a liquid mixture (e.g., a biological or a biochemical sample). The method of claim 33 involves a container that has (a) two ends; (b) a solid phase capable of binding nucleic acid and (c)

a reversible suction means connected to one end of the container. The container is a pipette with the solid phase located in the tip. The reversible suction means is used to draw the liquid mixture through the solid phase in one direction and then to force the liquid mixture over the solid phase in the reverse direction, so that nucleic acid in the sample binds to the solid phase. Support for claim 33 can be found throughout the Specification, for example, at page 1, lines 24-29; page 2, lines 10-11; page 3, lines 4-5; page 10, lines 26-30; page 11, lines 22-30; and figure 3.

Claim 34 relates generally to method for extracting nucleic acid from a liquid mixture (e.g., a biological or a biochemical sample). The method of claim 34 includes a container that has (a) two ends; (b) a solid phase capable of binding nucleic acid and (c) a reversible suction means connected to one end of the container. The reversible suction means is releasably connected to one of the ends on the container. The container is an extraction cartridge. The reversible suction means is used to draw the liquid mixture through the solid phase in one direction and then to force the liquid mixture over the solid phase in the reverse direction, so that nucleic acid in the sample binds to the solid phase. Support for claim 34 can be found throughout the Specification, for example, at page 1, lines 24-29; page 2, lines 24-25; page 3, lines 4-5; page 4, lines 4-6; page 10, lines 7-12; page 14, lines 16-21 and 23-27; page 15, lines 5-15; and figure 2.

Claim 35 relates generally to method for extracting nucleic acid from a liquid mixture (e.g., a biological or a biochemical sample). The method of claim 35 involves a container that has (a) two ends; (b) a solid phase capable of binding nucleic acid and (c) a reversible suction means connected to one end of the container. The container is an extraction cartridge having an inner surface with ridges or spirals. The inner surface

causes mixing between the liquid mixture and the solid phase. The reversible suction means is used to draw the liquid mixture through the solid phase in one direction and then to force the liquid mixture over the solid phase in the reverse direction, so that nucleic acid in the sample binds to the solid phase. Support for claim 35 can be found throughout the Specification, for example, at page 1, lines 24-29; page 3, lines 4-5; page 8, lines 29-30; page 10, lines 7-12 and 20-24; page 11, lines 8-21; page 14, lines 16-21; page 15, lines 5-15; and figures 2 and 6.

Claim 36 relates generally to method for extracting nucleic acid from a liquid mixture (e.g., a biological or a biochemical sample). The method of claim 36 involves a container that has (a) two ends; (b) a solid phase capable of binding nucleic acid and (c) a reversible suction means connected to one end of the container. The solid phase has surface groups with a pKa such that the electrostatic charge of the solid phase and its capability of binding nucleic acid varies with pH. The reversible suction means is used to draw the liquid mixture through the solid phase in one direction and then to force the liquid mixture over the solid phase in the reverse direction, so that nucleic acid in the sample binds to the solid phase. Support for claim 36 can be found throughout the Specification, for example, at page 1, lines 24-29; page 3, lines 4-5; page 5, lines 13-25; page 7, lines 8-11 and 21-24; page 11, line 8 through page 12, line 10; and page 15, lines 5-15.

Claim 37 relates generally to method for extracting nucleic acid from a liquid mixture (e.g., a biological or a biochemical sample). The method of claim 37 involves a container that has (a) two ends; (b) a solid phase capable of binding nucleic acid and (c) a reversible suction means connected to one end of the container. The solid phase

comprises a porous plug, wadding, frit, membrane or mesh. The reversible suction means is used to draw the liquid mixture through the solid phase in one direction and then to force the liquid mixture over the solid phase in the reverse direction, so that nucleic acid in the sample binds to the solid phase. Support for claim 37 can be found throughout the Specification, for example, at page 1, lines 24-29; page 3, lines 4-5; page 6, lines 21-25; page 10, lines 7-12, 14-15, and 20-24; page 11, lines 7-19; page 12, line 14 through page 13, line 12; page 15, lines 17-22; and figures 2, 4, and 6.

Claim 38 relates generally to method for extracting nucleic acid from a liquid mixture (e.g., a biological or a biochemical sample). The method of claim 38 involves a container that has (a) two ends; (b) a solid phase capable of binding nucleic acid and (c) a reversible suction means connected to one end of the container. The reversible suction means is syringe, the solid phase is located in a cartridge that is releasably connected to the nozzle of the syringe, and the solid phase has surface groups with a pKa such that the electrostatic charge of the solid phase and its capability of binding nucleic acid varies with pH. The reversible suction means is used to draw the liquid mixture through the solid phase in one direction and then to force the liquid mixture over the solid phase in the reverse direction, so that nucleic acid in the sample binds to the solid phase. Support for claim 38 can be found throughout the Specification, for example, at page 1, lines 24-29; page 2, lines 1-8; page 3, lines 4-5; page 5, lines 13-25; page 8, lines 1-4; page 10, lines 1-12; page 11, lines 8-21; page 12, lines 1-10; page 14, lines 16-27; page 15, lines 5-22; and figures 1 and 2.

Claim 39 relates generally to method for extracting nucleic acid from a liquid mixture (e.g., a biological or a biochemical sample). The method of claim 39 involves a

container that has (a) two ends; (b) a solid phase capable of binding nucleic acid and (c) a reversible suction means connected to one end of the container. The container is a pipette, the solid phase is located within the tip of the pipette, and the solid phase has surface groups having a pKa such that the electrostatic charge of the solid phase and its capability of binding nucleic acid varies with pH. The reversible suction means is used to draw the liquid mixture through the solid phase in one direction and then to force the liquid mixture over the solid phase in the reverse direction, so that nucleic acid in the sample binds to the solid phase. Support for claim 39 can be found throughout the Specification, for example, at page 1, lines 24-29; page 2, lines 10-11; page 3, lines 4-5; page 5, lines 13-25; page 10, lines 26-30; page 11, lines 23-30; page 13, lines 1-9; page 15, lines 5-22; and figure 3.

VI. Grounds of Rejection to be Reviewed on Appeal

There is only one ground of rejection to be reviewed on appeal:

Claims 1-22, 24, 26-30, and 32-39 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Blevins, WO 98/26872 A1, (1998) (Exhibit 1), Novotny, *et al.* U.S. Patent No. 5,453,382, (1995) (Exhibit 2), Stratagene: Cloning Systems, page 81, (1993) (Exhibit 3) and GIBCO BRL Products & Reference Guide, page 19-44, (1997/1998) (Exhibit 4) advertisements.

VII. Argument

A. Legal Standard for Obviousness

In proceedings before the Patent and Trademark Office, the Examiner bears the burden of establishing a prima facie case of obviousness based upon the prior art. See *In re Piasecki*, 745 F.2d 1468, 1471-73, 223 USPQ 785, 788 (Fed. Cir. 1984). To meet this burden, the Examiner must satisfy three requirements. First, all of the claim limitations must be taught or suggested by the prior art. See *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974); see also *In re Glaug*, 283 F.3d 1335, 1341-42, 62 USPO2d 1151, 1154 (Fed. Cir. 2002); *In re Rijckaert*, 9 F.3d 1531, 1533, 28 USPQ2d 1955, 1957 (Fed. Cir. 1993). Second, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine references. See *In re Rouffet*, 149 F.3d 1350, 1357, 47 USPQ2d 1453, 1457-58 (Fed. Cir. 1998). Third, there must be a reasonable expectation of success. See *In re Merck & Co., Inc.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir.1986). The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not in Applicants' disclosure. See *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

As a threshold requirement, the PTO must use only references analogous to the claimed invention to support a rejection under 35 U.S.C. § 103. See MPEP 2141.01(a). "In order to rely on a reference as a basis for rejection of an applicant's invention, the reference must either be in the field of applicant's

endeavor or, if not, then be reasonably pertinent to the particular problem with which the inventor was concerned." *In re Oetiker*, 977 F.2d 1443, 1446, 24 USPQ2d 1443, 1445 (Fed. Cir. 1992). See also *In re Deminski*, 796 F.2d 436, 230 USPQ 313 (Fed. Cir. 1986); *In re Clay*, 966 F.2d 656, 659, 23 USPQ2d 1058, 1060-61 (Fed. Cir. 1992).

Using only prior art references analogous to the claimed invention, the PTO must show motivation to combine the references. This motivation may flow, inter alia, from the references themselves, the knowledge of one of ordinary skill in the art, or from the nature of the problem to be solved. See In re Dembiczak, 175 F.3d 994, 999, 50 USPQ2d 1614, 1617 (Fed. Cir. 1999). Although a reference need not expressly teach that the disclosure contained therein should be combined with another, the showing of combinability, in whatever form, must nevertheless be "clear and particular." Dembiczak, 175 F.3d at 999, 50 USPQ2d at 1617. "Broad conclusory statements regarding the teaching of multiple references, standing alone, are not 'evidence.'" Id. at 999, 50 USPQ2d at 1617; see also In re Kotzab, 217 F.3d 1365, 1371, 55 USPQ2d 1313, 1318 (Fed. Cir. 2000) ("particular findings must be made as to the reason the skilled artisan, with no knowledge of the claimed invention, would have selected these components for combination in the manner claimed.") Absent a showing of such motivation and suggestion, prima facie obviousness is not established, as the Court of Appeals for the Federal Circuit has clearly indicated:

> The PTO has the burden under section 103 to establish a Prima facie case of obviousness…It can satisfy this burden only by showing some objective teaching in the prior art or that knowledge generally available to one of ordinary skill in the art would lead that individual to combine the relevant teachings of the references. See In re Fine, 5 USPQ2d 1596 at 1598 (Fed. Cir. 1988).

The PTO must consider the teachings of prior art references in their entirety, i.e. as a whole. Such consideration of the prior art requires that the PTO not ignore portions, that teach away from the claimed invention. W.L. Gore & Associates, Inc. v. Garlock, Inc., 721 F.2d 1540, 220 USPQ 303 (Fed. Cir. 1983), cert. denied, 469 U.S. 851 (1984). The Court of Appeals for the Federal Circuit has instructed that "references that teach away cannot serve to create a prima facie case of obviousness" (*In re Gurley*, 27 F.3d 551, 553 (Fed. Cir. 1994)), and that an "applicant may rebut a prima facie case of obviousness by showing that the prior art teaches away from the claimed invention in any material respect" (*In re Geisler*, 116 F.3d 1465, 1469 (Fed. Cir. 1997)).

Finally, proper consideration of the prior art also requires that the PTO not pick and choose to apply only those portions of the prior art which support the proposition that applicants' claimed invention is unpatentable. This is impermissible hindsight. "One cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention." Id. at 1075, 5 USPQ2d at 1600. As the Federal Circuit has held numerous times, such a hindsight analysis is impermissible.

B. The Cited References

1. The Blevins Reference

The Blevins reference discloses the separation of small molecule analytes such as food coloring and drugs. Specifically, Blevins "[p]rovides for preparing samples for subsequent analysis by separating liquid samples into their individual components." See Blevins page 3, lines 25-26. As shown in example 1, green food coloring is separated into its blue and yellow components. See Blevins, pages 7-9. Likewise, morphine and codeine in a urine sample are separated in example 2. See Blevins pages 9-10.

Blevins indicates that desired analytes from a given sample may be extracted using several different types of surface interactions. Blevins discloses the separation of analytes using hydrophobic and cationic surface interactions and exemplifies only methods and devices for separating hydrophobic and cationic, small molecule analytes. See Blevins at examples 1 and 2 and specifically page 8, lines 4-5. Blevins does not disclose or exemplify any method for separating nucleic acids.

2. The Novotny Reference

The Novotny reference exemplifies the extraction of said small molecule analytes (i.e., cimetidine and ranitidine) from mixtures using electrodes to apply a voltage gradient. Novotny provides no clue that such techniques could be used or adapted for separation of nucleic acids. See Novotny column 1, lines 50-56; example 1 at columns 7-9; and example 2 at columns 10-11.

3. The Stratagene Advertisement

The Stratagene Advertisement displays a Poly(A) Quik mRNA Isolation Kit that allows poly(A)$^+$ RNA to be isolated from total RNA. The advertised separation methods involve the passage of a liquid mixture through a nucleic acid binding column. The mixture is forced through the column in only one direction using applied pressure of a luer lock syringe. The Stratagene Advertisement does not teach forcing the liquid mixture over the column in one direction and back over the column in the reverse direction.

4. The GIBCO Advertisement

The GIBCO advertisement displays SPIN-EASE Extraction Tubes for nucleic acid separation. The advertised separation methods involve the passage of a liquid mixture through a nucleic acid binding substrate in only one direction. The Extraction Tubes require centrifugal force to pass nucleic acid containing mixtures through filter inserts to separate nucleic acid from solid materials. The GIBCO Advertisement does not teach forcing the liquid mixture through the extraction filter in one direction and back over the filter in the reverse direction.

C. The Examiner's Position

The Examiner argues that the method of claims 1-22, 24, 26-30, and 32-39 are obvious over the Blevins, Novotny, Stratagene and GIBCO references. The Examiner's position is that the skilled artisan would have been motivated to arrive at the Appellant's invention for extracting nucleic acid from a mixture by adapting the small molecule analyte methods and devices of Blevins and Novotny to enable nucleic acid separation, based on the Stratagene and GIBCO advertisements. The Examiner suggests that

motivation to combine the Blevins reference with the GIBCO and Stratagene advertisements is provided by Blevins' suggestion that the disclosed small molecule analyte separation devices can be manipulated so to bind "*desired analytes from a given sample.*" See Office Action dated May 8, 2006 at paragraph 22. The Examiner suggests that motivation to combine the Novotny reference with the GIBCO and Stratagene advertisements is provided by Novotny's disclosure that his devices and methods are suitable for "*a plethora of suitable biological samples.*" See Office Action dated May 8, 2006 at paragraph 22.

D. The Appellants' Position

Claims 1-22, 24, 26-30, and 32-39 are not obvious over the cited references. The claimed devices and methods relate generally to extraction of nucleic acid from a liquid mixture containing nucleic acid. The claimed devices and methods specifically involve a container that has a solid phase capable of binding nucleic acid and a reversible suction means connected to one end of the container. The reversible suction means is used to draw the liquid mixture through the solid phase in one direction and forces the liquid mixture over the solid phase in the reverse direction.

Appellant's claims are not obvious over Blevins in view of Novotny, Stratagene and GIBCO BRL Products for at least the following reasons:

1. The Blevins and Novotny references are not analogous to the claimed invention and do not qualify as proper § 103 references.

The claims recite methods and devices for extracting nucleic acids from a mixture. Blevins and Novotny do not disclose methods or devices for extracting nucleic acids. Rather, these references demonstrate the separation of non-analogous small molecule analytes (e.g., dye in Blevins' example 1, and drugs in Blevins' example 2, and cimetidine and ranitidine in Novotny's example 1).

The separation of small molecule drug and dye analytes is not in the field of applicant's invention, and is not at all pertinent to the separation of nucleic acids. Therefore, both Blevins and Novotny are non-analogous art and neither qualifies as a proper § 103 reference.

2. The GIBCO and Stratagene references teach away from the claimed invention and cannot serve as the basis for a proper § 103 rejection.

The claims recite methods and devices for extracting nucleic acids from a liquid mixture, using a reversible suction means to draw the mixture through a solid phase in one direction and forcing the mixture over the solid phase in the reverse direction, so that nucleic acids in the mixture bind to the solid phase. The teachings of the GIBCO and Stratagene advertisements are directly opposite to the presently claimed invention. The GIBCO and Stratagene references teach nucleic acid separation methods that involve the passage of a liquid mixture through a nucleic acid binding substrate in only one direction. Specifically, the devices in the GIBCO and Stratagene advertisements use centrifugal force or mechanical pressure, respectively, to pass a nucleic acid-containing mixture through a nucleic acid binding solid phase in one direction.

The uni-directional approach described in the GIBCO and Stratagene advertisements are in direct contrast to the bi-directional approach of the claimed invention. Thus, the GIBCO and Stratagene references teach away from the presently claimed invention in this material respect, and as instructed by The Court of Appeals for the Federal Circuit, the references cannot serve as the basis for a proper §103 rejection.

3. There is no motivation to combine the cited references, or any reasonable expectation of success in achieving the claimed invention.

The Examiner acknowledges that Blevins fails to teach nucleic acid separation. See Office Action dated May 8, 2006 at paragraph 13. The GIBCO and Stratagene advertisements are offered to cure this defect. The Office Action states that the motivation to combine the Blevins reference with the GIBCO and Stratagene advertisements is provided by Blevins' suggestion that the disclosed small molecule analyte separation devices can be manipulated to bind "*desired analytes from a given sample*." See Office Action at paragraph 22.

The offered evidence of motivation is not "clear and particular," as required. Further, the Office Action has taken a lone statement out of context and has failed to consider the Blevins reference as a whole. Blevins provides no clue that the disclosed small molecule analyte separation devices could be adapted and used for nucleic acid separation. In fact, considered as a whole, the Blevins reference suggests that the disclosed small molecule analyte separation devices would not be suitable for nucleic acid purification. While Blevins indicates that desired analytes from a given sample may be extracted using several different types of surface interactions, Blevins states that "*the*

hydrophobic analyte of interest is retained via hydrophobic interactions with the sorbent." See Blevins at page 8, lines 4-5. Blevins discloses the extraction of analytes using hydrophobic and cationic surface interactions and exemplifies only methods and devices for extracting hydrophobic and cationic analytes. See Blevins examples 1 and 2. Further, the methods and devices of disclosed in Blevins would not be expected to work to separate nucleic acids, which are not hydrophobic or cationic analytes. Thus, persons of skill in the art of nucleic acid separation would not be motivated to use the methods and devices disclosed in Blevins, much less have any reasonable expectation of success that the methods and devices could be used to separate nucleic acids. Blevins provides neither the motivation nor the reasonable expectation of success required to establish prima facie obviousness.

With regard to the Novotny reference, the Office Action suggests that motivation to combine the Novotny reference with the GIBCO and Stratagene advertisements is provided by Novotny's disclosure that his devices and methods are suitable for "*a plethora of suitable biological samples.*" See Office Action dated May 8, 2006 at paragraph 22. The offered evidence of motivation is not "clear and particular," as required. Further, the Office Action has taken a lone statement out of context and has failed to consider the Novotny reference as a whole. Novotny exemplifies the separation of small molecule analytes (i.e., cimetidine and ranitidine) from samples, using electrodes to apply a voltage gradient. Novotny provides no clue that such devices could be used or adapted for separation of nucleic acids. Thus, persons of skill in the art of nucleic acid separation would not be motivated to use the methods and devices disclosed in Novotny, much less have any reasonable expectation of success that the methods and

devices could be used to separate nucleic acids from a biological sample. Novotny provides neither the motivation nor the reasonable expectation of success required to establish prima facie obviousness.

4. Impermissible use of hindsight reconstruction.

The Office Action appears to be relying on hindsight in combining the Blevins Novotny, Stratagene and GIBCO references in arriving at an obviousness determination. The Office Action recognizes that neither Blevins nor Novotny discloses the isolation of nucleic acids and attempts to rely on the Stratagene and GIBCO advertisements to cure this deficiency. Recognizing that Blevins and Novotny fail to teach nucleic acid separation, the Examiner takes a lone statement from each reference out of context and couples them with general advertisements regarding nucleic acid separation. This is a textbook example of hindsight reconstruction. The Examiner has picked and chosen among isolated disclosures in the prior art to deprecate the claimed invention in an attempt to establish a *prima facie* case of obviousness.

E. Conclusion

In view of the forgoing discussion, Appellants respectfully submit that the subject matter defined by claims 1-22, 24, 26-30, and 32-39 is patentable over the cited art and that the Examiner has not met the burden of establishing a *prima facie* case of obviousness. Accordingly, Appellants respectfully request that the Board reverses the Examiner's final rejection of these claims under 35 U.S.C. § 103 and remand this application for issue.

Respectfully submitted,

Date: January 8, 2007

/Natalie A. Davis/
Natalie A. Davis
Reg. No. 53,849
Agent for Applicants

Invitrogen Corp.
1600 Faraday Ave.
Carlsbad, CA 92008
(760) 268-7469

VIII. Claims Appendix

1. A method for extracting nucleic acid from a liquid mixture containing nucleic acid, the liquid mixture comprising a biological or a biochemical sample, the method comprising (a) providing a container having a first and second end and containing a solid phase capable of binding nucleic acid and a reversible suction means connected to one of said ends; and (b) operating said reversible suction means to draw the liquid mixture through the solid phase in one direction and forcing the liquid mixture over the solid phase in the reverse direction, so that nucleic acid in the sample binds to the solid phase.

2. The method of claim 1, wherein the nucleic acid is DNA or RNA, or a mixture of both.

3. The method of claim 1, wherein the container has a volume less than or equal to 100 ml.

4. The method of claim 1, further comprising the step of expelling the liquid mixture from the container after extraction of nucleic acids.

5. The method of claim 1, further comprising washing the solid phase to remove bound materials other than nucleic acid.

6. The method of claim 1, further comprising removing the nucleic acids from the solid phase by eluting with a solvent.

7. The method of claim 1, further comprising reversibly drawing a second liquid mixture over the solid phase so that nucleic acid in the second liquid mixture binds to the solid phase.

8. The method of claim 1, further comprising homogenizing the liquid mixture prior to drawing the liquid mixture over the solid phase.

9. The method of claim 1, wherein the reversible suction means is a syringe.

10. The method of claim 1, wherein the container is a disposable cartridge.

11. The method of claim 1, wherein a syringe is the container and reversible suction means and the solid phase is contained in the barrel of the syringe.

12. The method of claim 1, wherein the container is a pipette and the solid phase is located in the tip of the pipette.

13. The method of claim 1, wherein the container is an extraction cartridge.

14. The method of claim 1, wherein the solid phase can move inside the container.

15. The method of claim 1, wherein the container and reversible suction means are releasably connected.

16. The method of claim 1, wherein the solid phase comprises porous or non-porous beads.

17. The method of claim 1, wherein the solid phase comprises polymeric material having surface groups which are pyrazole, pyrole, pyrrolidine, indole, pyrimidine, nucleic acid bases, imidazole, imines, amines, lysines or a group having a pKa in the range of 3 to 12.

18. The method of claim 16, wherein the beads are derivatised so that they are capable of selectively binding nucleic acid.

19. The method of claim 16, wherein the beads are retained in the container by a frit, porous membrane or mesh.

20. The method of claim 19, wherein the frit, porous membrane or mesh has a pore diameter of at least 0.1 mm.

21. The method of claim 1, wherein the container has an inner surface having ridges or spirals to cause mixing between liquid mixture and solid phase.

22. The method of claim 1, wherein the solid phase comprises one or more spaced apart discs or membranes, each having holes with a diameter of at least 0.1mm, or cut away sections.

23. The method of claim 1, wherein a by-pass channel runs through the solid phase.

24. The method of claim 1, wherein the solid phase has a pore size of greater than 0.1mm.

26. An extraction device for extracting nucleic acid from a liquid mixture containing nucleic acid, the liquid mixture comprising a biological or a biochemical sample, the device comprising (a) a container having first and second ends and containing a solid phase capable of binding nucleic acid and (b) reversible suction means which is connected to one of said ends and operates to draw the liquid mixture through said solid phase in one direction and force said liquid through said solid phase in the reverse direction, thereby causing said liquid mixture to pass up and down through said solid phase.

27. The extraction device of claim 26, wherein the container has a volume less than or equal to 100 ml and the solid phase is located within the barrel of the syringe.

28. The extraction device of claim 27 26, wherein the reversible suction means is a syringe and the solid phase is located in a cartridge releasably connected to the nozzle of the syringe.

29. The extraction device of claim 27 26, wherein the container is a pipette and the solid phase is located within the tip of the pipette.

30. The extraction device of claim 29, wherein an aerosol plug is located in the body of the pipette.

32. The method of claim 1, wherein the solid phase has surface groups having a pKa such that the electrostatic charge of the solid phase and its capability of binding nucleic acid varies with pH.

33. A method for extracting nucleic acid from a liquid mixture containing nucleic acid, the liquid mixture comprising a biological or a biochemical sample, the method comprising (a) providing a container having a first and second end and containing a solid phase capable of binding nucleic acid and a reversible suction means connected to one of said ends, wherein the container is a pipette and the solid phase is located in the tip of the pipette; and (b) operating said reversible suction means to draw the liquid mixture through the solid phase in one direction and forcing the liquid mixture through the solid phase in the reverse direction, so that nucleic acid in the sample binds to the solid phase.

34. A method for extracting nucleic acid from a liquid mixture containing nucleic acid, the liquid mixture comprising a biological or a biochemical sample, the method comprising (a) providing a container having a first and second end and containing a solid phase capable of binding nucleic acid and a reversible suction means releasably connected to one of said ends, wherein the container is an extraction cartridge; and (b) operating said reversible suction means to draw the liquid mixture through the solid phase in one direction and forcing the liquid mixture through the solid phase in the reverse direction, so that nucleic acid in the sample binds to the solid phase.

35. A method for extracting nucleic acid from a liquid mixture containing nucleic acid, the liquid mixture comprising a biological or a biochemical sample, the method comprising (a) providing a container having a first and second end and containing a solid phase capable of binding nucleic acid and a reversible suction means releasably connected to one of said ends, wherein the container is an extraction cartridge having an inner surface having ridges or spirals to cause mixing between the liquid

mixture and the solid phase; and (b) operating said reversible suction means to draw the liquid mixture through the solid phase in one direction and forcing the liquid mixture through the solid phase in the reverse direction, so that nucleic acid in the sample binds to the solid phase.

36. A method for extracting nucleic acid from a liquid mixture containing nucleic acid, the liquid mixture comprising a biological or a biochemical sample, the method comprising (a) providing a container having a first and second end and containing a solid phase capable of binding nucleic acid and a reversible suction means connected to one of said ends, wherein the solid phase has surface groups having a pKa such that the electrostatic charge of the solid phase and its capability of binding nucleic acid varies with pH; and (b) operating said reversible suction means to draw the liquid mixture through the solid phase in one direction and forcing the liquid mixture through the solid phase in the reverse direction, so that nucleic acid in the sample binds to the solid phase.

37. A method for extracting nucleic acid from a liquid mixture containing nucleic acid, the liquid mixture comprising a biological or a biochemical sample, the method comprising (a) providing a container having a first and second end and containing a solid phase capable of binding nucleic acid and a reversible suction means connected to one of said ends, wherein the solid phase comprises a porous plug, wadding, frit, membrane or mesh; and (b) operating said reversible suction means to draw the liquid mixture through the solid phase in one direction and forcing the liquid mixture through the solid phase in the reverse direction, so that nucleic acid in the sample binds to the solid phase.

38. An extraction device for extracting nucleic acid from a liquid mixture containing nucleic acid, the liquid mixture comprising a biological or a biochemical sample, the device comprising (a) a container having first and second ends and containing a solid phase capable of binding nucleic acid and (b) reversible suction means which is connected to one of said ends and operates to draw the liquid mixture through said solid phase in one direction and force said liquid through said solid phase in the reverse direction, thereby causing said liquid mixture to pass up and down through said solid phase, wherein the reversible suction means is a syringe, the solid phase is located in a cartridge that is releasably connected to the nozzle of the syringe, and the solid phase has surface groups having a pKa such that the electrostatic charge of the solid phase and its capability of binding nucleic acid varies with pH.

39. An extraction device for extracting nucleic acid from a liquid mixture containing nucleic acid, the liquid mixture comprising a biological or a biochemical sample, the device comprising (a) a container having first and second ends and containing a solid phase capable of binding nucleic acid and (b) reversible suction means which is connected to one of said ends and operates to draw the liquid mixture through said solid phase in one direction and force said liquid through said solid phase in the reverse direction, thereby causing said liquid mixture to pass up and down through said solid phase, wherein the container is a pipette, the solid phase is located within the tip of the pipette, and the solid phase has surface groups having a pKa such that the electrostatic charge of the solid phase and its capability of binding nucleic acid varies with pH.

IX. Evidence Appendix

Exhibit	Title of Exhibit	Location in Record
Exhibit 1	Blevins, WO 98/26872 A1, (1998)	Cited by Examiner in Office Action dated August 25, 2005 and May 8, 2006
Exhibit 2	Novotny, *et al.* U.S. Patent No. 5,453,382, (1995)	Cited by Examiner in Office Action dated August 25, 2005 and May 8, 2006
Exhibit 3	Stratagene: Cloning Systems, page 81, (1993)	Cited by Examiner in Office Action dated August 25, 2005 and May 8, 2006
Exhibit 4	GIBCO BRL Products & Reference Guide, page 19-44, (1997/1998)	Cited by Examiner in Office Action dated August 25, 2005 and May 8, 2006

X. Related Proceedings Appendix

None.